UNITED
NATIONS

E

Economic and Social Council

Distr.
GENERAL

E/C.7/1991/11
18 March 1991

ORIGINAL: ENGLISH

COMMITTEE ON NATURAL RESOURCES
Twelfth session
25 March-4 April 1991
Item 9 of the provisional agenda*

DISASTER PREVENTION AND MITIGATION IN DEVELOPING AND UTILIZING NATURAL RESOURCES

Activities of the United Nations system concerning disaster prevention and mitigation in developing and utilizing natural resources

Report of the Secretary-General

SUMMARY

The present report has been prepared in response to decision 11/1 of the Committee on Natural Resources, in which the Committee requested the Secretary-General to prepare, for its consideration at the twelfth session, a comprehensive report on the activities of the United Nations system in the area of disaster prevention and mitigation in developing and utilizing natural resources. The report contains the information provided by organizations and agencies of the United Nations system on their activities in that area.

* E/C.7/1991/1.

CONTENTS

	Paragraphs	Page
INTRODUCTION	1 - 2	4
INFORMATION RECEIVED FROM ORGANS, ORGANIZATIONS AND BODIES OF THE UNITED NATIONS SYSTEM	3 - 97	4
A. United Nations	3 - 44	4
1. Economic and Social Commission for Asia and the Pacific	3 - 25	4
2. Economic Commission for Latin America and the Caribbean	26 - 27	8
3. United Nations Development Programme	28 - 30	9
4. Office of the United Nations Disaster Relief Coordinator	31 - 33	9
5. United Nations Centre for Human Settlements (Habitat)	34 - 36	10
6. United Nations University	37 - 42	11
7. Department of Technical Cooperation for Development	43 - 44	11
B. Specialized agencies	45 - 97	13
1. Food and Agriculture Organization of the United Nations	45 - 49	13
2. United Nations Educational, Scientific and Cultural Organization	50 - 67	14
3. World Meteorological Organization	68 - 83	18
4. World Health Organization	84 - 86	21
5. World Bank	87 - 89	21
6. International Maritime Organization	90 - 94	22
7. International Fund for Agricultural Development	95 - 97	23

CONTENTS (continued)

Page

Annex. Synoptic table of the potential of organizations and agencies to contribute to disaster prevention and mitigation in developing and utilizing natural resources 25

INTRODUCTION

1. The Committee on Natural Resources, in its decision 11/1 of 5 April 1989, decided to include in the agenda of its twelfth session an item entitled "Disaster prevention and mitigation in developing and utilizing natural resources", on the understanding that the Committee would treat the item in a focused manner and in full accord with the theme assigned to it by the Economic and Social Council. The Committee requested the Secretary-General to prepare, for submission to the Committee at its twelfth session, a comprehensive report on the activities undertaken by the United Nations system in connection with disaster prevention and mitigation in developing and utilizing natural resources.

2. The present report has been prepared in response to the above decision and contains the information received from organs, organizations, agencies and funds of the United Nations system concerning their activities related to disaster prevention and mitigation in developing and utilizing natural resources. The annex to the report contains a synoptic table of the potential of organizations and agencies to contribute to disaster prevention and mitigation.

INFORMATION RECEIVED FROM ORGANS, ORGANIZATIONS AND BODIES OF THE UNITED NATIONS SYSTEM

A. United Nations

1. Economic and Social Commission for Asia and the Pacific

3. The Economic Commission for Asia and the Pacific (ESCAP) continues to be involved in promoting and enhancing cooperative efforts in the Asia and Pacific region to mitigate the damage from typhoons, cyclones, floods and droughts. Continuous support has been provided to the ESCAP/World Meteorological Organization (WMO) Typhoon Committee and the ESCAP/WMO Panel on Tropical Cyclones, two intergovernmental bodies.

4. The medium-term plan for the period 1984-1989, under programme 7 (Natural Resources in Asia and the Pacific), included a programme element on the mitigation of damage from cyclones, floods and drought, which has been continued in the current medium-term plan.

5. With a view to the rational development and utilization of land and water resources and the reduction of flooding, a manual and guidelines for flood risk analysis and mapping were prepared and finalized at an expert group meeting in 1988. The manual and guidelines have been published and widely distributed.

6. ESCAP has recently prepared a study on problems caused by natural disasters in selected least developed and developing island countries of the region. In addition, a report on long-term effective measures to mitigate the effects of disasters was published as part of the Water Resources Series. Work on phase I of the urban flood loss prevention project was completed by fielding missions to eight

major cities in the region and holding a workshop. The proceedings of the project were published as part of the Water Resources Series.

7. A manual and guidelines for comprehensive flood loss prevention, also related to developing and utilizing natural resources, has been finalized and will be issued shortly. Advisory missions and seminars are being organized in concerned member countries in order to disseminate the techniques outlined in the manual and guidelines.

8. The programme of work related to water resources for the biennium 1990-1991 has been designed to take into account the requirements of the International Decade on Natural Disaster Reduction. A project entitled "Promotion of measures for reduction of water-related disasters in Asia and the Pacific through research, training and advisory services - phase I" was included in the programme of work. A separate activity, the ESCAP/Office of the United Nations Disaster Relief Coordinator (UNDRO) Regional Symposium on the International Decade on Natural Disaster Reduction, was held at Bangkok from 11 to 15 February 1991. Participants from 25 member and associate member countries of ESCAP were invited to the Symposium, which considered the question of disasters as a result of cyclones, floods, droughts, earthquakes, tsunamis and volcanic eruptions. Another project, on the assessment of current preparedness programmes, forecasting systems and operational methods for water-related natural disaster reduction in the ESCAP region, is scheduled to be held at Bangkok from 29 April to 3 May 1991. Advisory missions will be sent to countries wishing to introduce or enhance preparedness programmes, on the basis of the recommendations of the workshop.

9. A report on preparedness, including available mechanisms and facilities, and measures for water-related natural disasters, consequences, mitigation and prevention in the interested countries of the region is expected to be submitted to the ESCAP Committee on Natural Resources for its consideration at its sixteenth session, at Bangkok in September 1991.

10. Future activities in water-related natural disaster reduction include a proposal for a workshop to develop guidelines for the application of cyclonic storm hydrology in natural disaster reduction in the region.

11. In the draft programme of work of the Water Resources Section for the biennium 1992-1993, the subject of natural disaster reduction was assigned the highest priority. Starting in 1992, two new projects will be introduced. The first one involves integrated river system development and management, with reference to comprehensive flood loss prevention and management. The second relates to storm surge risk mapping and analysis.

12. The future activities of ESCAP include providing assistance to member States in the following areas:

(a) Preparation of flood risk maps;

(b) Preparation of storm surge maps;

(c) Implementation of various aspects of comprehensive flood loss prevention and management;

(d) Establishment of guidelines for the application of cyclonic storm hydrology;

(e) Establishment or upgrading of national disaster prevention and preparedness plans;

(f) Improvement of damage assessment and reporting;

(g) Study of effects of deforestation, urbanization and changing land use on the hydrology of the catchment and on the intensity of floods;

(h) Drought hazard assessment;

(i) Tsunami maps etc.

13. Since 1985, the Mineral Resources Section of ESCAP has been involved in various disaster reduction activities through the programme entitled "geology for urban development". Studies were carried out in a number of cities affected by seismic risk, subsidence, groundwater contamination, highly compressive soils and karst collapse. The following meetings were organized within the urban geology programme: (a) Expert Working Group Meeting cum Workshop on the Urban Geology of Coastal Areas (Shanghai, October 1987); (b) Seminar on Geological Mapping in the Urban Environment (Bangkok, October 1986); and (c) Meeting on Quaternary Geosciences and Human Survival (Bangkok, November 1988), in cooperation with the United Nations Educational, Scientific and Cultural Organization (UNESCO).

14. ESCAP activities during the period 1987-1990 have included a systematic survey of the urban geology of more than 77 areas in 20 countries. These studies have been published in the Atlas of Urban Geology series, the most recent volume of which was issued in late 1990 and covered geology for land-use planning in Asia. The studies noted that large cities in Asia have spread into areas in which geological conditions are unsuitable for various land uses. As a result of the ESCAP programme, planners and geologists have worked together to develop a series of thematic maps that would be useful for land-use planning. The maps show areas affected by both man-made and natural hazards.

15. Other activities include the provision of in-house training in urban geology and the mapping of large cities in a number of countries. More recently, these studies focused on the mitigation of seismic risk in Indonesia, subsidence in Hanoi, Viet Nam, and assessment of the damage resulting from the 16 July 1990 earthquake in the Philippines. A series of meetings have also reviewed the impact of man on Quaternary environments and were especially concerned with the mapping and correlation of Quaternary stratigraphy in the region. These latter activities were organized jointly by ESCAP and UNESCO as part of International Geological Correlation Programme Project 296, Quaternary of the Asia/Pacific region. ESCAP arranged a Seminar on Geology and Land-Use Planning, at Kuching, Malaysia, and two workshops on Quaternary geology of the Asia/Pacific region, in Malaysia and

Thailand in 1989 and 1990 respectively. A course on assessment and evaluation of construction materials for urban development was organized at Kuala Lumpur in 1990.

16. ESCAP continues to provide assistance to member States in the mitigation of earthquakes, volcanic eruptions, landslides and various other types of natural disasters.

17. The ESCAP/United Nations Development Programme (UNDP) Regional Remote-Sensing Programme, which deals with the promotion of operational uses of remote sensing and geographical information systems in natural disaster reduction, for better development and utilization of land and water resources, organized a workshop on the application of remote sensing to flood plain mapping and monitoring at Dhaka in December 1989.

18. A pilot project on flood mapping and monitoring using remote-sensing and GIS technologies has been completed jointly by Bangladeshi and Chinese experts through arrangements for technical cooperation among developing countries, under the coordination of the ESCAP/UNDP Regional Remote-Sensing Programme. A methodology for flood plain mapping and monitoring using integrated remote-sensing and GIS technologies has been developed and will be tested in Bangladesh in 1991.

19. In cooperation with the Outer Space Affairs Division and the Government of China, the Regional Remote-Sensing Programme is organizing an interregional seminar on remote-sensing applications to disaster monitoring, to be held in September 1991. The seminar will emphasize operational methodology for disaster monitoring and forecast through remote-sensing and GIS technologies.

20. In its next phase, from 1992 to 1996, the Regional Remote-Sensing Programme will place special emphasis on promoting the capabilities of member countries in using GIS technology, as well as microwave technology, such as synthetic aperture side-looking radar and high-resolution satellite data for disaster monitoring and assessment. Priority will be given to the least developed countries to transfer low-cost, PC-based image processing and GIS technologies for operational uses in disaster management.

21. The Environment Section of ESCAP organized a Conference at the Ministerial Level on Environment and Development in Asia and the Pacific, which was held at Bangkok from 10 to 16 October 1990. The agenda of the Conference included regional cooperation in disaster warning measures and in the field of coastal area resources development and management, which identified the directions of technology transfer and recommended the establishment of an international centre on early detection and warning of approaching cyclones. The Ministerial Declaration welcomed the establishment of research, training, policy and other institutes and centres dealing with environmental and development activities with a view to promoting exchange of information, technical assistance and regional cooperation. ESCAP should play an important role in fulfilling that task.

22. The Human Settlement Unit of ESCAP undertook research on disaster mitigation policy measures and, in 1987, published a study on human settlement planning in disaster-prone areas, focusing on the management of marginal settlements. The

study reviewed the current policies and practices of member countries for disaster mitigation, in particular through land-use planning, building design and codes and training programmes.

23. In the future, the Unit will organize seminars and workshops to exchange experiences and knowledge on disaster mitigation measures.

24. Since 1984, the Agriculture and Rural Development Division of ESCAP has been carrying out the Agro-climatic Assessment Programme in eight developing countries members of ESCAP. The project was designed to develop national capabilities to predict crop failures and food shortages caused by the impact of drought. Later, in 1989, remote-sensing technology was incorporated into the crop assessment systems. This new phase of the programme, known as the Satellite Crop Monitoring (SCM) Project, has been implemented in Indonesia, Malaysia, the Philippines and Thailand, initially on a pilot basis.

25. A Regional Evaluation Seminar on Satellite Crop Monitoring was held at Bangkok in November 1990 to assess the usefulness and efficacy of the SCM Project. The Seminar recommended that the SCM Project be continued in the future and that the upcoming phase, if funding could be obtained (estimated at $US 1.45 million), would include Bangladesh, China, Nepal, Sri Lanka and Viet Nam, which have expressed interest in joining the Project.

2. Economic Commission for Latin America and the Caribbean

26. Between 1988 and 1990, the Economic Commission for Latin America and the Caribbean (ECLAC), in close cooperation with WMO and using extrabudgetary support provided by the Government of Italy, executed a technical cooperation project entitled "Prevention of natural disasters in Latin America and the Caribbean". Its main purpose was to define existing capabilities and needs concerning the establishment of flood forecasting systems in the region. After a detailed survey was completed, a proposal was formulated to undertake the design and implementation of flood forecasting systems in 15 selected river basins located in an equal number of countries in the region. The Governments discussed and agreed upon the proposal, which will be submitted shortly to the Government of Italy for financing.

27. ECLAC has continued to assist its member Governments in assessing the social and economic impact of major natural disasters. Furthermore, and as part of the rehabilitation and reconstruction efforts following such disasters, ECLAC has assisted in the formulation of projects or schemes for disaster prevention and mitigation. It is completing the publication of a Manual for the Assessment of the Socio-economic Effects of Natural Disasters, which contains the methodology developed by ECLAC for assessing the damage caused by disasters of either meteorological or geological origin.

3. United Nations Development Programme

28. UNDP resident representatives are ex officio representatives of UNDRO and their role is of considerable importance in representing that organization to the host Government, especially in issues concerning disaster mitigation.

29. As at December 1990, UNDP funds devoted to ongoing rehabilitation projects totalled $12.6 million. Other projects principally devoted to post-disaster reconstruction and rehabilitation had important disaster preparedness and mitigation components.

30. During 1990, with a view to improving its institutional capacity in this area, UNDP initiated the following activities:

(a) Disasters and development. UNDP has commissioned a study on institution-building as related to this subject. The objective of the study is to produce a set of lessons learned on the way in which Governments are addressing the effects of slow-onset or recurrent natural disasters, and to derive from those lessons recommendations on how UNDP can best cooperate with Governments through the programming process to mitigate the effects of disasters. The study, which is being carried out in three stages, including extensive field studies in three countries, is expected to be completed in January 1991.

(b) UNDP/UNDRO Disaster Management Training Programme. Parallel to the above study, UNDP and UNDRO have launched a cooperative effort for training the staff of the two organizations in disaster reduction matters, with particular emphasis on the links between disaster reduction and the ongoing development process. This training scheme has brought together a consortium of university-based disaster management institutions at the global level, regional institutions in each of the four developing regions, and country-level institutions and personnel involved in disaster management. The emphasis will be on training country personnel (comprising United Nations system personnel, non-governmental organizations, bilateral donor representatives and government representatives, including those from government central planning organizations) in the techniques of integrating disaster mitigation activities into ongoing development programmes, as well as assisting them to function as a country team in a disaster situation. It is planned that approximately 4,000 persons will receive training of varying duration and content over the next three to four years. The training will focus on the needs of personnel in 50 disaster-prone developing countries.

4. Office of the United Nations Disaster Relief Coordinator

31. The role of UNDRO in disaster mitigation is to assist Governments and advise them of the entire spectrum of policies and measures that can be taken in advance of a disaster to reduce its impact. These include identification of prevailing hazards, estimation of risk (probable losses from given disaster scenarios), formulation and implementation of mitigation programmes, creation of institutional structures responsible for disaster mitigation and management, and training of those responsible for the technical and organizational aspects of obtaining and disseminating knowledge on those subjects.

32. Some of these activities address the risks related to developing and utilizing natural resources, including water supply, petroleum exploitation, nuclear power plants, hydropower, and the transport of dangerous chemicals. For example, UNDRO has given advice on volcanic risks to an oleoduct in Colombia in 1985, on earthquake and landslide risks to a vital petroleum pipeline in northern Ecuador in 1987, and on marine oil spill emergency planning in the Caribbean. It has participated in an evaluation of the consequences of the Chernobyl nuclear disaster and the lessons learned for the protection of communities from future occurrences of this kind. In Argentina, in 1988, it helped to establish a procedure for investigating and mitigating risks to the population downstream of a major water reservoir. In Egypt, in 1989 and 1990, it assisted in evaluating risks related to dam failure as well as those arising from the contamination of groundwater resources. In Colombia, in 1990, as part of a broad-spectrum project in disaster mitigation, UNDRO helped to organize a seminar on preparedness for industrial hazards and those relating to the transport of dangerous materials.

33. In promoting such activities, the role of UNDRO is to a large extent promotional and advisory, taking into account the expertise and facilities available within other parts of the United Nations system and in the academic and research fields. The primary function of UNDRO is to ensure that national disaster management authorities are fully aware of risks and of the most appropriate mitigative measures.

5. United Nations Centre for Human Settlements (Habitat)

34. The United Nations Centre for Human Settlements (Habitat) (UNCHS), through its operational activities, is assisting Governments in various aspects of pre-disaster planning and preparedness and mitigation of natural disasters as they affect human settlements. The Centre also carries out research, training and information activities concerning such issues as settlement planning in disaster-prone areas, seismic surveys, vulnerability analysis, microzoning, remote sensing, modelling, and land-use planning.

35. The operational activities of the Centre include the implementation of projects in Algeria, Bangladesh, Bolivia, Dominica, Ecuador, El Salvador, Kenya, Mexico, Nepal, Peru, the Turks and Caicos Islands, Viet Nam, Yemen and Yugoslavia. These projects deal with a wide range of issues, including the following: reconstruction of housing and settlements, hurricane-resistant housing, seismic mitigation, earthquake-resistant structures, including low-cost housing, and the use of appropriate technologies to prevent or mitigate the impact of disasters.

36. The Centre is also addressing the issue of natural resources use and technologies in the context of its research programme, which includes such activities as the Symposium on Mitigation of the Effects of Seismic Activities on Human Settlements, held at Tbilisi, Georgian Soviet Socialist Republic, in 1989; the presentation of a research paper to the World Bank Colloquium on the Environment and Natural Disaster Management in 1990; and the UNCHS/World Bank project on disaster prevention and mitigation in metropolitan areas, 1991-1992.

6. United Nations University

37. The United Nations University (UNU) in collaboration with the Department of Mineralogy of the University of Geneva, is planning an annual course on the study of risk geology, to take place from 22 April to 5 June 1991, at the University of Geneva.

38. The objectives of the course are to develop expertise that would permit saving lives and reduce economic damages resulting from natural hazards. This expertise will be utilized to create or strengthen institutions involved in monitoring and research of natural hazards in countries where these are prevalent.

39. The course, leading to a certificate of specialization, consists of two parts: (a) lectures on selected subjects (six weeks) and (b) individual thesis (four weeks). The curriculum incorporates theoretical courses with practical laboratory and field work. A one-week multi-disciplinary field study is included in a volcanic risk zone. A thesis based on individual research is expected to demonstrate the aptitude of the candidate to tackle a problem scientifically.

40. The contribution of UNU to the course consists of providing lectures and financial aid to participants from developing countries.

41. The United Nations University is carrying out the Mountain Ecology and Sustainable Development Research and Training Programme, which is concerned with the interrelationship between mountain ecology and human activities and the interaction of mountains and lowlands. The programme focuses on developing interdisciplinary methods and systematic approaches to the management of complex mountain ecosystems that will help to combine the often conflicting objectives of conservation and development.

42. Within the framework of the above programme, there has been a continuous effort to develop methods for natural hazard mapping in mountain areas, analysing risks for landslides and other phenomena threatening human activities. Geographical information systems are utilized for this purpose. This is an ongoing activity within the programme.

7. Department of Technical Cooperation for Development

43. The Department's ongoing activities in the prevention and mitigation of disasters in the development and utilization of natural resources are as follows:

(a) Flood loss prevention. The Department has completed projects in Argentina, Bangladesh, Honduras, Nicaragua and Paraguay, which dealt with the development of models for flood mitigation, the establishment of flood warning systems, flood control in river basins, and designing systems to reduce flood damage in valleys. Several ongoing projects and programmes incorporate various aspects of disaster planning and preparedness, while other projects concentrate on post-disaster rehabilitation. A sample of ongoing projects covering flood and/or erosion issues include:

(i) Bangladesh. Protection of the left bank of the Brahamaputra River from erosion resulting from strong currents, especially during floods;

(ii) China. Assisting the Government in setting up a national centre to monitor the performance and impact (including flood control) of high dams using computer-based digital models and modern sensors and techniques;

(iii) India. Improving national capabilities for hydrographic surveying in major reservoirs and in developing measures to deal with sedimentation problems so as to prevent flooding possibilities;

(iv) Viet Nam. Examining the dynamics of coastal and ocean environmental protection and improving living conditions in coastal areas by planning for and mitigating adverse effects of beach erosion and typhoon and monsoon surges.

(b) Drought mitigation. A project in Somalia is rebuilding 10 walls in drought-prone areas to reduce livestock pressure on rangelands and to prevent overgrazing at single major water points. In the Sudan, an ongoing project is supplying equipment to be used in the construction of water points to serve the nomads in the eastern region.

(c) Publications:

(i) Guidelines for Flood Loss Prevention and Management in Developing Countries, Natural Resources/Water Series No. 5 (ST/ESA/45), 1/ addressed to persons involved with the formulation of programmes and policies for flood loss prevention and management in the context of regional and national development;

(ii) Flood Damage Prevention and Control in China, Natural Resources/Water Series No. 11 (ST/ESA/119), 2/ containing findings and recommendations of a workshop held in China, the objectives of which were to exchange information and experience with regard to methodological, technological and organizational approaches to the prevention and control of floods and to promote cooperation among developing countries in this area.

(d) Energy sector. Certain natural disasters, for example, floods, typhoons and tropical storms, often seriously damage electric power plants and transmission lines. The Department is assisting several countries in restoring their power systems. Activities include developing comprehensive information databases, early warning systems for possible damage to power systems, training of national staff and institutional strengthening to deal with such events, and integrating power sector disaster prevention and preparedness programmes into the national planning process in countries victimized by such occurrences.

(e) Minimization of environmental impacts in the production, transportation and storage of crude oil and petroleum products. An ongoing project in China is undertaking a marine engineering geological survey to strengthen the capabilities of the oil industry in oil spill prevention and control during oil production and transportation in the South China Sea.

44. The Department is also supporting projects on earthquake and landslide hazard assessment in Turkey and on appraisal of natural hazards along the Cameroon line financed by UNDP.

B. Specialized agencies

1. Food and Agriculture Organization of the United Nations

45. The activities of the Food and Agriculture Organization of the United Nations (FAO) in the field of disaster prevention and mitigation started in 1960 when specialists from WMO, UNESCO and FAO launched a large-scale agrometeorology project, which has so far published five surveys covering the Near East, the Sahelian zone, East Africa, the Andean zone and South-East Asia. Another survey on the humid low areas of South America is being carried out at the present time.

46. A climatic database was created in 1971 and now covers more than 3,000 stations in developing countries. Following the World Food Conference in 1974, agrometeorological crop monitoring was started in the Sahel and has now been extended to other African and Asian countries. The data generated from the above activities are used for monitoring disasters related to weather anomalies (drought and floods) that may have an impact on developing and utilizing land and water resources.

47. The Global Information and Early Warning System on Food and Agriculture monitors and reports on crop conditions and food supply in all developing countries. The Food Security Assistance Scheme assists countries in formulating national food security policies and programmes and in establishing and strengthening national and regional early warning and food information systems, thus contributing to disaster preparedness, prevention and management.

48. FAO, through its Fisheries Department, promotes national and international action for the rational development and management of world fisheries resources. Due attention is being given to such environmental factors as changes in atmospheric and oceanographic conditions which may adversely affect fishery resources, fishing fleets and fishing communities. The Department has also undertaken pre-disaster activities such as forecasting the potential yields of a number of fish stocks from available biological data and other information on fisheries.

49. Under the Tropical Forestry Action Plan, joint inter-agency and donor efforts coordinated by the FAO Forestry Department are aimed at reducing the negative impact of deforestation and thus preventing certain disasters. Such disasters as windstorms, floods, landslides, wild fires, tropical deforestation, desertification and drought are addressed by FAO through such prevention and mitigation measures as shelter-belt plantations, watershed management, afforestation and forest management, fire control, land use changes, fuel wood plantations, sand dune stabilization, utilization of alternative fuels and adoption of drought-resistant crops.

2. United Nations Educational, Scientific and Cultural Organization

50. Since 1960, UNESCO has been engaged in the assessment and mitigation of risks arising from natural hazards of geological origin (earthquakes, tsunamis, volcanic eruptions and landslides), and contributes to the study of hazards of hydrometeorological origin (storms, floods, prolonged droughts, desertification and avalanches).

51. The objectives of the Organization's activities in the field of natural disasters are the following: (a) to promote a better understanding of the distribution in time and space of natural hazards and of their intensity; (b) to set up reliable early warning systems; (c) to devise rational land-use plans; (d) to secure the adoption of suitable building design; (e) to protect educational buildings and cultural monuments; (f) to strengthen environmental protection for the prevention of natural disasters; (g) to enhance preparedness and public awareness through education and training; and (h) to foster post-disaster investigation, recovery and rehabilitation.

52. These activities are carried out through networking and strengthening of regional and international coordination systems, direct partnership with member States, field implementation of operational projects, reconnaissance and advisory missions, preservation and dissemination of data, seminars and training courses. Cooperation is maintained with competent international and non-governmental bodies. In implementing these activities, UNESCO performs under its regular programme and budget, and also as executing agency of specific projects financed by extrabudgetary sources, in particular UNDP, and trust funds.

53. The Intergovernmental Meeting on Seismology and Earthquake Engineering and the Intergovernmental Conference on the Assessment and Mitigation of Earthquake Risk, convened by UNESCO in 1964 and 1976 respectively, were the first large-scale international events to bring together specialists in seismology, earthquake engineering and the socio-economic aspects of earthquakes. The results of those two meetings were the main elements in forming the Organization's programme on earthquake hazards during subsequent years.

54. The main activities undertaken since 1960 include the establishment of international, regional and national centres, systems and networks for the exchange and analysis of earthquake data and training; identification of seismically active zones and the quantitative assessment of earthquake hazards in those zones; field studies of the effects of large earthquakes; and the training of specialists in seismology and earthquake engineering.

55. Examples of such activities include the following:

(a) The establishment of the International Institute of Seismology and Earthquake Engineering, Japan, 1963-1972, which, since 1964, annually trains scientists and engineers from different countries;

(b) The establishment of the Institute of Earthquake Engineering and Engineering Seismology, Yugoslavia, 1965-1978; international post-graduate training at the Institute has been sustained by UNESCO since 1979;

(c) The establishment of the International Seismological Centre, United Kingdom. The Centre uses one of the world's fastest computers to process the data it receives from observatories throughout the world and to produce its definitive bulletins of earthquakes;

(d) The establishment of the Regional Seismological Centre for South America (CERESIS), Peru. The Centre acts as a link between national seismological services and coordinates and executes regional studies of seismicity and earthquake risk;

(e) The establishment of the Regional Seismological Network in South-East Asia, 1973-1978, and the training of scientific and technical personnel to operate the network;

(f) Projects on the survey of seismicity and on earthquake risk reduction in the Balkan region, 1970-1976, 1980-1984 and 1988- . These projects brought together seismologists, geologists and engineers from six countries in a pioneering effort to define seismic risk on a regional basis and in terms directly applicable to earthquake-resistant design and construction, and to implement action towards the reduction of this risk. An important organizational output was the creation of a Permanent Coordinating Committee on Earthquake Risk Reduction in the Balkan Region, which is now operational;

(g) The feasibility study for the assessment and mitigation of earthquake risk in the Arab region, and the implementation of national projects in this region on training of personnel in seismology, engineering seismology, earthquake engineering and civil defence, 1982. This is being done in the framework of the Programme for Assessment and Mitigation of Earthquake Risk in the Arab Region. In relation to this programme, modern seismological networks, seismic hazards zonation, and earthquake-resistant building codes are being developed in the countries of the region;

(h) The initiation of a project on seismological recording and earth sciences studies in the African continent, 1990- ;

(i) Contribution to the cooperative project for seismic risk reduction in the Mediterranean region, 1990- ;

(j) The copying of historical seismograms and excavation of historical seismic data in selected regions, 1983- ;

(k) The establishment of a National Seismological Observatory Network, Romania, 1979-1982;

(l) The establishment of a strong-motion telemetry network and of an experimental site for earthquake prediction, in the Beijing region, China, 1981-1984;

(m) The modernization and reinforcement of seismological services, Viet Nam, 1987- ;

(n) The control of the seismic microzonation study in the El-Asnam region, Algeria, 1983-1984.

56. In the field of volcanic hazards, particular attention is being given to techniques for detecting and monitoring the phenomena preceding violent eruptions, and to problems of communication between scientists, civil defence services and the general public. Hence, two sets of general guidelines have been issued on volcanic hazards zonation and on volcanic emergency management.

57. At the request of the Governments of the countries concerned, short-term advisory missions of volcanologists have been sent, since 1963, to investigate volcanic crises. Specialized meetings are organized, as needed, to review past volcanic activity in specific regions and the status of volcanological surveillance. UNESCO has investigated problems, needs and solutions for training and research in volcanology in the western Pacific region.

58. In 1984, UNESCO completed a feasibility study on an International Mobile Early-warning System for Volcanic Eruptions (IMEWS), which has permitted the revision of existing volcano-monitoring facilities and the identification of 100 high-risk volcanoes in the world. It has laid the foundation of IMEWS, which operates on-the-site training at specific volcanoes, volcano monitoring, volcanic hazards mapping and expert reconnaissance missions. The Directory of Volcano Observatories, published annually by IMEWS, provides information on available scientific resources and contact points in member States.

59. International cooperation in tsunami warning was formally initiated by UNESCO in 1965. In that year, the Intergovernmental Oceanographic Commission (IOC) set up an International Tsunami Information Centre (ITIC), now located in Honolulu, which works closely with the Tsunami Warning System in the Pacific, operated by the United States.

60. IOC also established an International Coordination Group for the Tsunami Warning System in the Pacific (ITSU), which today numbers 23 member countries. Convened biennially since 1968, ITSU meetings provide an opportunity for member States to examine together means for tsunami preparedness and risk mitigation.

61. Two regional tsunami warning centres were established in the Pacific, one in Alaska and the other in Hawaii, which deal with tsunami warnings in the northern part of the Pacific. Among the major efforts foreseen by ITSU is the development of a subregional tsunami warning system in the south-west Pacific.

62. Various studies have been conducted by UNESCO on the cause and prevention of landslides, in particular the publication of guidelines on landslides hazards zonation. The United Nations Environment Programme (UNEP)/UNESCO project on the protection of the lithosphere as a component of the environment (1981-1984) resulted in significant multinational landslide research and mitigation. The project sponsored international workshops and seminars and published research and mitigation studies that have proved significant in landslide risk reduction.

63. During the International Hydrological Decade (1965-1974) and under the International Hydrological Programme (IHP), which developed in several phases, considerable attention has been given to hydrological hazards. The hydrological processes of these phenomena, including river floods and flood-risk assessment, had been studied, as well as the management and prevention aspects. This is part of the Organization's Water Science Programme, whose aim is to improve the assessment, planning and management of the world's water resources.

64. The publications of UNESCO on this subject include the World Catalogue of Very Large Floods and a work entitled Floodflow Computation, which contains a compilation of the methods employed in computing the magnitude and frequency of large floods, with particular reference to the use of such methods in the design of engineering works for flood control.

65. Field studies of catastrophic floods are made by UNESCO scientific missions. A number of countries have requested assistance in connection with problems related to floods, flood forecasting and resulting effects, including Brazil for the City of Rio de Janeiro, Peru for the Andes valley and Cuzco area, and Yemen for flood prevention in Wadi Hadhramaut. A mathematical model of the Mekong Delta was built for flood warning, and a study of flood control in the Pantanal region of Brazil was carried out.

66. Studies on drought and desertification were undertaken in the framework of the International Hydrological Decade and IHP and the Man and Biosphere (MAB) Programme, which started in 1971. A special IHP technical report was devoted to improving the understanding of the relationship between climate variability and drought. In 1977, a map of the world distribution of arid regions and a set of case-studies on desertification were prepared for the United Nations Conference on Desertification, held at Nairobi in the same year. Hence, arid land studies, including drought and desertification problems, have been given an important place in MAB activities. These studies are undertaken in the framework of integrated pilot projects aimed at better understanding the functioning of arid and semi-arid ecosystems and at devising optimal land-use systems in drought-prone areas, thus contributing to combating desertification in these areas. Such projects were developed in particular in Africa (Sahelian countries, Kenya, Lesotho and Tunisia). A large number of scientific publications and guidelines, tailored to decision makers and the general public, have emanated from these projects, including poster and audio-visual series.

67. Various studies on the cause and prevention of land subsidence have been conducted within the framework of the International Hydrological Decade and, since 1975, of IHP and the International Geological Correlation Programme (IGCP). Two IGCP projects, sea-level correlation and applications, 1983-1987 and coastal evolution in the Quaternary, 1988-1992, are particularly related to dangers arising from the subsidence of lowland plains. The Major Interregional Project on Research and Training Leading to the Integrated Management of Coastal Systems (COMAR) considers the relationship between the global-related mean sea-level change and natural hazards such as the flooding of low-lying coast and the impact of tsunamis on the coastal zones.

3. World Meteorological Organization

68. The two natural resources that are fundamental to life on this planet are air and water, and WMO has major responsibilities for both. Knowledge of the atmosphere and of freshwater resources depends upon the sciences of meteorology and hydrology and their applications, particularly through the activities of the world's meteorological and hydrological services. Weather and climate are often thought of as resources in the same way that the fresh waters of the globe are considered, but they can also be thought of in terms of the natural hazards their vicissitudes generate such as tropical cyclones, floods and drought.

69. The atmosphere, its composition and circulation, its interaction with the hydrosphere, heat transfer, solar radiation and the water cycle are the subject of continuous monitoring, analysis and forecasting activities carried out by WMO members under various programmes such as the World Weather Watch (WWW), the Global Atmosphere Watch (GAW), the Integrated Global Ocean Services System (IGOSS) (together with IOC), and the Tropical Cyclone Programme (TCP). Since 1963, the WWW system has provided the global operational structures for this enormous task, which comprises regular observations, real-time data collection and exchange and processing at the global, regional and national levels. Many of these activities are aimed at the assessment of short-term developments, including those relating to acute emergencies such as tropical cyclones and massive releases of hazardous materials (nuclear or chemical), which are of vital importance for the use of the natural resource air in various fields of application.

70. The objectives of the WMO Tropical Cyclone Programme are to promote and facilitate coordinated and cooperative action at the international, regional and national levels to provide upgraded and more effective warnings of tropical cyclones and associated floods and storm surges (project 18.3), and the dissemination of warnings, together with strengthening the related community preparedness for the mitigation of loss of life, human suffering, destruction of property and the set-back to social and economic development, particularly in developing countries (projects 18.5 and 18.6). WMO disaster prevention and preparedness activities are usually conducted in cooperation with other agencies, such as UNDRO, the League of Red Cross and Red Crescent Societies, and the regional commissions.

71. The WMO arrangements to respond to nuclear or other environmental emergencies comprise the real-time exchange of monitoring data needed for the assessment of the emergency situation and regular short-range predictions of the transport, deposition or dispersion of hazardous materials. This system is established as part of the emergency response under the International Atomic Energy Agency (IAEA) Convention on Early Notification and Assistance in Case of Nuclear Accidents or Emergencies, but is also applicable to other types of environmental disasters, making use of the observing, telecommunications and data-processing capabilities of the WWW system.

72. The WMO Global Atmosphere Watch was introduced as an "umbrella" system in 1989 to integrate the many monitoring and research activities involving the measurement of chemical composition and physical characteristics of the atmosphere. It serves

as an early warning system to detect further changes in atmospheric concentrations of greenhouse gases, changes in the ozone layer and in the long-range transport of pollutants, including acidity and toxicity of precipitation, as well as the atmospheric burden of aerosols and the radiation balance. GAW will facilitate the prediction of future states of the atmosphere and related earth systems and will be a framework to plan, design, advise, coordinate and scientifically evaluate global atmospheric-composition monitoring activities that will affect decisions on the environment in the twenty-first century.

73. Solar energy and wind energy are other forms of natural resources used for power production without pollution and greenhouse side-effects. Through its Weather Prediction Research and Tropical Meteorology Research Programmes, WMO assists the national and regional activities needed to evaluate these forms of resources, in relation to their location, duration, intensity and reliabilities. These activities include diagnosis and prediction of weather systems and analysis of the weather situation and historical records to give reliable forecasts of weather phenomena favourable to generate solar and wind energy.

74. The use of these types of resources is subject to the following risks: (a) drought, as a result of long periods of fine weather with immense solar energy, especially in the tropics; and (b) flooding, as a result of tornadoes, severe thunderstorms and tropical cyclones associated with high wind energy.

75. The work of WMO in the field of weather prediction research and tropical meteorology provides useful information for national and regional efforts to minimize these risks. It is well understood that climate variations are one of the primary causes of natural hazards such as drought or insect infestation (e.g., locusts).

76. Climate and its variability affect many aspects of socio-economic developments, and are usually considered as given environmental conditions that should be studied, monitored, accounted for, adapted to and, eventually, used in the most profitable way. Hence, an appraisal of climate as a natural resource may now be subject to significant change. It is the speed of change that could in the future be considered a hazard, since neither ecological nor socio-economic systems would be able to adapt to it without serious losses. To assess the potential impact of climate change and that of changes of magnitude and probability of associated meteorological hazards, regional details of climate change should be known.

77. To that end, at the international level, WMO is involved in all aspects of the climate change issue. Together with UNEP, WMO established the Intergovernmental Panel on Climate Change (IPCC). The first report of IPCC included an assessment of available scientific information on climate change, an assessment of environmental and socio-economic impacts of climate change and the formulation of options for response strategies.

78. When assessing available scientific information on climate change, special attention is being paid to the questions of regional distribution of climate change and of extreme events such as tropical storms. The existing model disagreements

with respect to regional and smaller-scale predictions are analysed with a view to clarifying the underlying reasons for such disagreements.

79. WMO promotes the participation of developing countries in global climate change studies and related environmental issues. A resolution on this subject, which was adopted by the Executive Council of WMO at its forty-first session, in 1989, recognizes the importance of enabling the developing countries to enhance their scientific appreciation of the physical basis for climate change, to better comprehend the potential impacts of climate change and be adequately informed for assessing practical response strategies. A programme of information transfer to the developing countries on the issues of climate change, addressed to scientists, the public at large and policy decision makers, is an essential part of WMO activities in this area.

80. Water is a basic resource used for drinking, for the production of food, for waste disposal, power production, transport and the like. Through its Hydrology and Water Resources Programme, WMO promotes the national and regional activities required to assess this resource, in particular the location, magnitude, quality and reliability of water supplies. These activities involve the collection, storage and analysis of data and the provision of the hydrological forecasts required to ensure the optimum operation of water resource projects.

81. The development and use of water resources is subject to three types of risk:

(a) Flooding as a result of an excess of water;

(b) Drought as a result of a shortage of water;

(c) Man-made disasters as a result of inadequately designed works (e.g., a dam breaks) or incorrect procedures (e.g., accidental pollution).

82. The work of WMO in the field of hydrology provides support for national efforts to minimize all three risks. Technical guidance is developed on the forecasting of floods and on the monitoring of drought periods. Advice is offered on the means of estimating the risk of such natural disasters and the action that can be taken to reduce their impact. Much of the same technology is also appropriate in alleviating the risks and impact of man-made disasters.

83. The activities of WMO in relation to hydrology and water resources do not only include the provision of guidance and advice to member States, but also a system for the international transfer of appropriate proven technology and, with the support of UNDP and various donors, the implementation of a wide range of technical cooperation projects in developing countries. These contribute at the same time to the implementation of both the Mar del Plata Action Plan and the International Decade for Natural Disaster Reduction.

4. World Health Organization

84. The responsibility of the World Health Organization (WHO) in disaster reduction is an integral part of its mandate, which has long stressed the importance of preventive measures and emergency preparedness, and reaffirms the role of WHO as the lead United Nations agency in the health aspects of disaster preparedness. Moreover, WHO gives priority to linking disaster reduction measures to long-term development activities, which ultimately strengthen the health preparedness and response capabilities of its member States.

85. With respect to the development and utilization of natural resources and the health aspects of disaster mitigation, several clear technical links can be identified:

(a) Adequate sanitation and safe water supply is one of the cornerstones of primary health care. WHO has long given technical priority to the development of community water supplies in developing countries. The recent cholera outbreak in Peru underscores the importance of adequate urban and rural water supply systems that minimize the transmission risk of water-borne diseases;

(b) Solar energy is necessary for essential health equipment. The availability of solar-powered refrigerators and short-wave radios provides a key support for country-based responses in disasters of all kinds. Outlying rural areas must often cope with erratic supplies of kerosene and electricity. In this situation, when health workers, as frontline responders to meningitis epidemics or population displacements, depend on reliably refrigerated vaccines, solar-powered equipment can play a critical role. Similarly, solar-powered short-wave radios allow health services to provide essential information, in both the initial and the relief phases of natural or other disasters;

(c) Earthquake and wind-resistant construction techniques are needed. Vast experience has shown that health facilities should be constructed in such a way that they could support their communities during disasters of all kinds. During the Mexico earthquake in 1985, more than 5,000 hospital beds were lost. Hazard-resistance is increasingly a criterion that must be incorporated into the design of health facilities and hospitals.

86. WHO recognizes that the above measures not only help to minimize the impact of disasters, but also complement and strengthen existing health services.

5. World Bank

87. Increasingly, the World Bank initiatives in this area are aimed at strengthening preventive measures to protect future development projects from potential catastrophes and to arrest environmental degradation that could spark further natural disasters. In June 1990, the Bank convened a Colloquium on Disasters, Sustainability, and Development: A Look to the 1990s, bringing together specialists in development, natural disasters and the environment to share experiences in disaster prevention, mitigation, response and reconstruction, and to

consider strategies for reducing the devastating impact of natural hazards in the 1990s. Specifically, the colloquium examined the ability of societies to organize and cope with potentially slow-acting but progressive disasters, such as sea-level rise or drought arising from global climate change, and discussed ways of improving resilience in disaster-prone developing countries.

88. The Bank and the United Nations Centre for Human Settlements (Habitat) are collaborating on a joint proposal on disaster prevention and mitigation in metropolitan areas. The objective of the project is to help reduce the vulnerability of metropolitan areas to extreme events and to address the urgent need for a better understanding of disaster prevention and mitigation in disaster-prone developing countries.

89. The Bank has also expanded its research in this area.

6. International Maritime Organization

90. The International Maritime Organization (IMO) has developed an international strategy to facilitate cooperation among Governments to protect the marine environment from pollution from ships and related activities. One of the objectives of the strategy is to strengthen the capacity of countries, in particular the developing countries, to take national and regional action in response to environmental threats.

91. Coastal and marine resources, including fisheries, tourist facilities and port and shipping installations, need to be developed in an environmentally sound and sustainable manner, which can only be brought about through international cooperation. The IMO strategy provides the necessary framework for such cooperation by promoting the adoption and implementation of international standards and measures to prevent marine pollution, as well as the dumping of wastes, from ships.

92. The principal international instruments containing norms and standards to prevent ship pollution and the dumping of wastes at sea are the International Convention for the Prevention of Pollution from Ships and the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972, as amended.

93. In addition, the following measures may be available to coastal States under the IMO strategy:

(a) Assessment of the extent to which the coastline of a particular country is affected by marine pollution;

(b) Research and development of viable solutions to marine pollution problems, where possible reflecting local technological capabilities and indigenous material and expertise;

(c) Formulation of national policies and adoption of relevant legal provisions to implement applicable international rules and standards;

(d) Prevention and clean-up measures, including the installation of different kinds of pollution combating equipment, enforcement of regulations and training of clean-up teams.

94. In developing and implementing the above measures, IMO seeks at all times to ensure appropriate cooperation with relevant international and regional organizations, including the organizations and bodies of the United Nations system. IMO is fully aware that wasteful duplication must be avoided and that the protection of the environment can only be achieved through a coordinated approach of all parties concerned.

7. International Fund for Agricultural Development

95. The International Fund for Agricultural Development (IFAD), which has the specific mandate of rural poverty alleviation, funds agricultural and rural development projects in developing countries. In its efforts to target the poorest populations in rural areas the Fund has increasingly focused on marginal agro-ecological areas where the links between natural resource degradation and poverty are quite severe. The Fund seeks to assist small farmers in their transition to more sustainable production systems. By emphasizing interventions that are compatible with the constraints imposed by fragile natural resources, the Fund seeks to minimize the vulnerability of small farmers to environmental shocks and natural disasters and limit the resource pressures that give rise to disequilibria in agro-ecosystems. In this way, the welfare impacts of natural disasters are mitigated.

96. Examples of IFAD activities that are especially relevant in this regard include the following: in Africa, the Special Programme for Sub-Saharan African Countries Affected by Drought and Desertification, in which the main thrust has been the introduction of environmentally sound and sustainable agricultural technologies (based on traditional systems); in Asia, the Small-scale Flood Control Project in Bangladesh, which has assisted in building embankments and regulatory water control structures and drainage facilities to eliminate flooding in low-lying areas; in the Islamic Republic of Iran, through a joint project with the Office of the United Nations High Commissioner for Refugees (UNHCR), IFAD has initiated the South Khorasan Rangeland Rehabilitation and Refugee Income-generating Project, which is serving to mitigate a potential disaster situation, owing to the influx of a large number of refugees from across the border; in the Near East and North Africa, natural disasters owing to the pressure of refugee populations crossing international borders has been averted by IFAD interventions in Mauritania and Algeria, which have helped in the resettlement of refugees and in the provision of gainful employment.

97. In addition to investment project interventions in natural resource management, the Fund, through its Technical Assistance Grant Programme, has supported applied research and development in addressing desert locusts, the cassava mealybug infestation and, more recently, the new world screwworm infestation in North Africa.

Notes

1/ United Nations publication, Sales No. E.76.II.A.7.

2/ United Nations publication, Sales No. E.82.II.A.13.

Annex

Synoptic table of the potential of organizations and agencies to contribute to disaster prevention and mitigation in developing and utilizing natural resources

Organization	Type of hazard						
	Floods	Cyclones/ tsunamis	Earthquakes and volcanic eruptions	Drought and desertification	Industrial and nuclear accidents	Landslides and avalanches	Ecological and health hazards (water/air quality)
DTCD	X	X	X	X	X	X	X
UNDP	X			X			X
UNEP				X			X
UNU			X		X	X	
ECA				X			
ECE	X		X		X		X
ECLAC	X		X				
ESCAP	X	X	X	X	X	X	X
ESCWA							
UNCHS (Habitat)	X		X		X	X	X
UNDRO	X		X		X	X	X
WFP	X	X				X	
ILO							X
FAO	X			X		X	
UNESCO	X	X	X	X		X	
WHO							X
WMO	X	X		X	X		X
IMO							X
IFAD	X			X			
UNIDO			X		X		
IAEA	X	X	X		X	X	
WORLD BANK	X	X		X			